24. (New) A pattern observation method according to claim 1, wherein the scanning of the charged particle beam includes: performing a first charged particle beam radiation on the sample with a charged particle beam radiating apparatus, thereby charging a surface of the sample; and performing a second charged particle beam radiation on the sample with the charged particle beam radiating apparatus, thereby scanning the charged particle beam over the pattern.--

IN THE DRAWINGS:

Subject to the Examiner's approval, please amend Figure 17 by changing reference numeral "162" to "161," as indicated in red on the copy of the originally filed drawing attached to the enclosed Request for Approval of Drawing Change.

REMARKS

In the Office Action, the Examiner objected to the specification because of certain informalities. The Examiner objected to the drawings as failing to comply with 37 C.F.R. § 1.84(p)(4). It appears the Examiner rejected claims 1–22 under 35 U.S.C. § 103(a) as follows: claims 1–4 are rejected as unpatentable over U.S. Patent 6,344,750 ("*Lo*") in view of U.S. Patent RE37,560 ("*Elings*"); claims 5–7 and 9–10 are rejected as unpatentable over *Lo* in view of *Elings*, in further view of U.S. Patent 6,128,089 ("*Ausschnitt*"); and claims 8 and 11–22 are rejected over *Lo* in view of *Elings*, in further view of *Ausschnitt*, and in still further view of U.S. Patent 5,093,572 ("*Hosono*").

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Specification

The Examiner objected to the specification because of certain informalities. The identified informalities have been corrected. No new matter has been added. Withdrawal of the objection is respectfully requested.

Drawings

The Examiner objected to the drawings as failing to comply with 37 C.F.R. § 1.84(p)(4). The informalities identified by the Examiner have been corrected in the enclosed Request for Approval of Drawing Change. Withdrawal of the objection is respectfully requested.

Amendment

Applicants have amended the specification and drawings as requested by the Examiner and without regard to any prior art reference. Applicants have amended claims 6 and 16 to more particularly claim the invention. Amendments to the specification and claims are indicated in the attached Appendix with deletions indicated by square brackets and insertions indicated by underlining. Amendments to the drawings are indicated in the enclosed Request for Approval of Drawing Change. No new matter has been added.

Rejection of claims

Claim 1 recites:

> A pattern observation apparatus comprising: a table generating section for generating a table in which a scan order is associated with scan positions; a charged particle beam scanning mechanism for scanning, according to the table, a charged particle beam over a sample on which a pattern is formed; . . . an image information generating

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> section for rearranging the secondary electron detection signals in association with the scan positions on the basis of the table, thereby generating image information of a surface of the sample . . . .

The Examiner rejected claim 1 as unpatentable over *Lo* in view of *Elings*. The Examiner notes that *Lo* fails to disclose or suggest "the use of a table in which scan order is associated with scan positions." (Paper No. 4 at 5.) That is, *Lo* fails to disclose or suggest, at least, "a table generating section for generating a table in which a scan order is associated with scan positions," "a charged particle beam scanning mechanism for scanning, *according to the table*, a charged particle beam over a sample on which a pattern is formed," and "an image information generating section for rearranging the secondary electron detection signals *in association with the scan positions on the basis of the table*, thereby generating image information of a surface of the sample," as recited in claim 1. The Examiner asserts, however, that *Elings* discloses "a scan control system for scanning probe microscopes that utilizes a look-up table which relates scan position parameters to scan voltage, and scan size parameters," which allegedly compensates for this deficiency. (Paper No. 4 at 5.) Applicants respectfully disagree.

Elings discloses a method for controlling a scanner for scanning probe microscopes. The method comprises a high speed computer to process position data of a scanner according to an algorithm. (*Elings*, col. 7, lines 43–48.) Motion of a scanner 30 is sensed by an external motion sensor 40. (*Id.*, col. 8, lines 24–30; Figure 2.) The sensor signal is transmitted to a computer 50, which receives the scan size, scan offset, and scan frequency entered by an operator to update the parameters of a scan voltage generator 20. (*Id.*, col. 8, lines 33–38.) Updating the parameters of a scan

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voltage generator 20 allows an operator to vary the scan voltage waveform and change the scanning motion of the sensor. (*Id.*) This process is demonstrated in a flow chart in which a sensor input signal determines scanner position data. (*Id.*, col. 8, lines 45–49; Figure 3.) A curve is fitted to the position data to generate coefficients for a scanner position polynomial. (*Id.*, col. 8, lines 49–51; Figure 3.) The difference between the measured coefficients and coefficients stored in memory is used to estimate an error in the scan. (*Id.*, col. 8, lines 51–56; Figure 3.) If the magnitude of error is determined to be large enough, the coefficients of the scan voltage are updated using a look-up table, which relates scanner position parameters to scan voltage parameters. (*Id.*, col. 8, lines 59–63; Figure 3.) That is, *Elings* discloses a method for controlling a scanner that will update coefficients such as scan size, scan position, and linearity using a look-up table, which relates scanner position parameters to scan voltage parameters. This fails to compensate for the deficiencies of *Lo*.

For example, it cannot be said that a method for controlling a scanner that will update coefficients such as scan size, scan position, and linearity using a look-up table, which relates scanner position parameters to scan voltage parameters is the same as, "a table generating section for generating a table in which *a scan order* is associated with scan positions," as recited in claim 1.

Elings also fails to disclose, "an image information generating section for rearranging the secondary electron detection signals *in association with the scan positions on the basis of the table*, thereby generating image information of a surface of the sample," as further recited in claim 1. The Examiner appears to assert this element

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is disclosed in *Lo*, however, as previously discussed, *Elings* and *Lo* do not disclose or suggest "a table generating section for generating a table in which a scan order is associated with scan positions." Thus, *Lo* cannot disclose or suggest "an image information generating section for rearranging the secondary electron detection signals in association with the scan positions *on the basis of the table*."

As *Lo* and *Elings* fail to disclose or suggest each element of claim 1, their combination cannot render the claim obvious, and claim 1 is allowable over the references. As claims 2–4, 23 and 24 depend from claim 1, they are likewise allowable over the cited references.

The Examiner rejected claim 5 as unpatentable over *Lo* in view of *Elings*, and further in view of *Ausschnitt*. *Ausschnitt* discloses a target for measurement of critical dimensions bias on a substrate. The Examiner does not suggest, and *Ausschnitt* does not disclose or suggest, however, the above-noted deficiencies of *Lo* and *Elings*. Thus, even assuming, *arguendo*, there were motivation to combine the three references, their combination still would not render claim 5 obvious.

Withdrawal of the rejection of claims 1–5 is respectfully requested.

Claim 6 recites:

> A pattern observation apparatus for observing a pattern by radiating a charged particle beam on a sample in which the pattern is formed on a substrate, the apparatus comprising: a first beam radiation section for performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample . . . .

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The Examiner rejected claim 6 as unpatentable over *Lo* in view of *Elings* and further in view of *Ausschnitt*. *Lo*, at best, discloses a method for detecting defects in a pattern substrate. The method includes applying a wafer bias, which may be controlled to vary the beam landing energy on wafers with, e.g., thin layers of silicide. (*Lo*, col. 7, lines 4–20.) This is not the same, however, as "a first beam radiation section for performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and *a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern*, and charging a surface of the sample," as recited in claim 6. *Elings* and *Ausschnitt* each fail to compensate for this deficiency. *Elings* discloses a method of controlling a scanner for scanning probe microscopes. And *Ausschnitt* discloses a target for measurement of critical dimensions bias on a substrate. Neither, however, discloses the above claim element.

Thus, even if there were motivation to combine the three cited references, their combination would not disclose or suggest the combination of elements recited in claim 6. Claim 6 should therefore be allowed over the cited references. Claims 7 and 9–10 should likewise be allowable at least because of their dependence from claim 6.

Claim 8 was rejected over *Lo* in view of *Elings* and further in view of *Ausschnitt* and still further in view of *Hosono*. *Hosono* discloses a SEM for cross-section observation of a semiconductor wafer, however it fails to compensate for the noted deficiencies of the other three references. Thus, even if there were motivation to combine the four cited references, their combination would not disclose or suggest the

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combination of elements recited in claim 8. Claim 8 should therefore be allowable over the cited references.

Withdrawal of the rejection of claims 6–10 is respectfully requested.

Claim 11 recites:

> A pattern observation method comprising the steps of: generating a table in which a scan order is associated with scan positions; scanning a charged particle beam over a sample according to the table; . . . rearranging the secondary electron detection signals in association with the scan positions on the basis of the table, thereby generating image information of a surface of the sample . . . .

The Examiner rejected claim 11 as unpatentable over *Lo* in view of *Elings*, in further view of *Ausschnitt*, and in still further view of *Hosono*. As noted above with respect to claims 1 and 5, *Lo*, *Elings*, and *Ausschnitt* fail to disclose or suggest, at least, "*generating a table* in which *a scan order is associated with scan positions*; scanning a charged particle beam over a sample according to the table;. . . [and] rearranging the secondary electron detection signals in association with the scan positions *on the basis of the table*, thereby generating image information of a surface of the sample," as recited in claim 11. *Hosono* fails to compensate for these deficiencies.

As previously discussed, *Hosono* discloses a SEM for cross-section observation of a semiconductor wafer, which fails to compensate for the deficiencies of *Lo*, *Elings*, and *Ausschnitt*. Thus, even if there were motivation to combine these four references, their combination would not disclose or suggest the combination recited in claim 11. Claim 11 is, therefore, allowable over these references. Claims 12–15 are likewise allowable over the references at least because of their dependence from claim 11.

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Withdrawal of the rejection of claims 11–15 is respectfully requested.

Claim 16 recites:

> A pattern observation method for observing a pattern by radiating a charged particle beam on a sample in which the pattern is formed on a substrate, the method comprising: a first step of performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample . . . .

The Examiner rejected claim 16 as unpatentable over *Lo* in view of *Elings*, in further view of *Ausschnitt*, and in still further view of *Hosono*. As noted above with respect to claim 6, *Lo*, *Elings*, and *Ausschnitt* fail to disclose or suggest, at least, "a first step of performing a first charged particle beam radiation on a sample in which a pattern is formed on a substrate and *a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern*, and charging a surface of the sample," as recited in claim 16.

As noted above, *Hosono* fails to compensate for the deficiencies of *Lo*, *Elings*, and *Ausschnitt*. Thus, even if there were motivation to combine these four references, their combination would not disclose or suggest the combination recited in claim 16. Claim 16 is, therefore, allowable over these references. Claims 17–22 are likewise allowable over the references at least because of their dependence from claim 16.

Withdrawal of the rejection of claims 16–22 is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request the reconsideration and timely allowance of the pending claims.

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Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
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Dated: January 9, 2003

By: _____
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APPENDIX

Specification

Please amend the paragraph on page 9 lines 6–16 as follows:

The sample is charged in the following method. FIG [10] 13 shows an example of the relationship between the acceleration voltage of the electron beam and the emission efficiency of secondary electrons. In this case, the sample is a resist, the abscissa indicates the acceleration voltage, and the ordinate indicates the emission efficiency of secondary electrons from the sample surface. The resist is positively charged with the range of the acceleration voltage between 400V and 1000V so that the [amount] emission efficiency of secondary electrons emitted from the surface may exceed 1.

Please amend the paragraph on page 27 lines 12–23 as follows:

FIG. 10C shows the relationship between the beam scan position and the secondary electron amount. As is shown in FIG. 10C, the amount of secondary electrons increases in a region of the center position x1 of the underlying mark 104, where the surface potential is low, that is, in a region which is negatively charged. However, the amount of secondary electrons decreases in a region of the position x2 distanced from the center position x1 in the beam scan direction, where the surface potential is relatively high. The [decreases] decreasing amount of secondary electrons are observed as a dark portion if they are detected by the detector 107 (not shown).

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Claims

6. (Amended) A pattern observation apparatus for observing a pattern by radiating a charged particle beam on a sample in which the pattern is formed on a substrate [and a first film is formed on the substrate including the pattern], the apparatus comprising:

a first beam radiation section for performing a first charged particle beam radiation on [the] a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample;

a second beam radiation section for scanning the charged particle beam over the pattern under conditions different from conditions for the first charged particle beam radiation; and

an observation section for observing the pattern by detecting secondary electrons from the surface of the sample.

16. (Amended) A pattern observation method for observing a pattern by radiating a charged particle beam on a sample in which the pattern is formed on a substrate [and a first film is formed on the substrate including the pattern], the method comprising:

a first step of performing a first charged particle beam radiation on [the] a sample in which a pattern is formed on a substrate and a surface of the substrate including the pattern is covered with an insulating film whose surface is flat including the pattern, and charging a surface of the sample;

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a second step of scanning the charged particle beam over the pattern under conditions different from conditions for the first charged particle beam radiation; and

a third step of observing the pattern by detecting secondary electrons from the surface of the sample.

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